

Patent Claims

1. Machining machine (1) for lenses with a first workpiece drive (4a) configured as a transport receptacle, with a workpiece spindle (4.1), a workpiece changer (2.1) for exchanging workpieces between the workpiece drive (4a) and a workpiece stock (3), and a machining station (5) for machining a workpiece, wherein
  - a) the workpiece spindle (4.1) of the workpiece drive (4a) can rotate about an axis of rotation (c1),
  - b) the workpiece drive (4a) can swivel about a first swivel axis (b1) arranged at right angle to the axis of rotation (c1) and
  - c) the workpiece drive (4a) can turn about a turning axis (k) arranged at right angles to the first swivel axis (b1),characterized in that  
at least one second workpiece drive (4b) is provided and
  - d) the second workpiece drive (4b) has a spindle (4.1, 4.1') which can turn about an axis of rotation (c1, c2),
  - e) both workpiece drives (4a, 4b) can swivel about a first swivel axis (b1, b2) arranged at right angles to the respective axis of rotation (c1, c2),
  - f) both workpiece drives (4a, 4b) are driven in translatable motion and can each move in the direction of a translatable axis of displacement (x1, x2), arranged at right angles to the first swivel axis (b1, b2),
  - g) both workpiece drives (4a, 4b) can turn together about the turning axis (k).
2. Device per Claim 1, characterized in that the workpiece drives (4a, 4b) have a common translatable lifting axis (w), arranged in parallel with the swivel axis (k), being mounted and driven to move in its direction.

3. Device per Claim 1 or 2, characterized in that two workpiece changers (2.1, 2.1') are provided and each of the workpiece changers (2.1, 2.1') can swivel about a swivel axis (s) arranged at right angles to the lifting axis (w) between a position W1 beneath the workpiece drive (4a, 4b) and at least one position W2 above the workpiece stock (3) and is driven in translatory motion in the direction of a lowering axis (n1, n2) arranged in parallel with the lifting axis (w).
4. Device according to one of the preceding claims, characterized in that the workpiece can be transported by the workpiece changer (2.1) between a position beneath the workpiece drive (4a, 4b) and a position above the workpiece stock (3) and can be swiveled through 180° in this process.
5. Device according to one of the preceding claims, characterized in that the machining station is configured as a polishing station (5) and has at least two polishing plates (5a, 5b), each of which are driven and guided to turn about a polishing axis (p1, p2) and move in the direction of a translatory telescopic axis (z1, z2), arranged in parallel with the polishing axis (p1, p2).
6. Device per Claim 5, characterized in that the respective polishing plate (5a, 5b) has an air-cushioned telescopic drive, able to turn about the polishing axis (p1, p2) and move in the direction of the telescopic axis (z1, z2), while the polishing plate (5a, 5b) is connected via a bellows (5.2, 5.2') and a universal joint to the polishing axis (p1, p2).
7. Device per Claim 6, characterized in that the telescopic drives of the polishing plates (5a, 5b) have a common motor and are connected to it via a traction means, such as a poly-V-belt.

8. Device according to one of Claims 5 to 7, characterized in that the polishing plates (5a, 5b) are each coordinated with a tool changer (6a, 6b) or a common tool changer (6), having at least one tool magazine (6.1) for polishing tools.
9. Device per Claim 8, characterized in that the tool changer (6a, 6b) is driven and can move in the direction of a translatory transport axis (t1, t2) and in the direction of a translatory exchange axis (a1, a2), arranged at right angles to this.
10. Device according to one of Claims 8 or 9, characterized in that the tool magazine (6.1, 6.1') is configured as a revolving drum, and the drum (6.1, 6.1') is coordinated with a liquid container, by which at least a part of the tool can be wetted with liquid by the turning of the drum (6.1, 6.1').
11. Device according to one of Claims 8 to 10, characterized in that the tool magazine (6.1, 6.1') has a quick locking element for securing to the particular turning axis and a securing element determining the relative position within the machine.
12. Device according to one of the preceding claims, characterized in that a washing station (7) is provided with at least two washing places (7.1, 7.1'), which can be brought into a position S underneath the workpiece drive (4a, 4b).
13. Device per Claim 12, characterized in that the washing station (7) can move in translatory motion in the direction of a lifting axis (h).

14. Device according to one of the preceding claims, characterized in that the workpiece spindle (4.1, 4.1') is connected to a swivel motor (4.3, 4.3') having the first swivel axis (b1, b2), wherein the swivel motor (4.3, 4.3') is arranged via a translatory carriage (4.4, 4.4') having the displacement axis (x1, x2) on a common swivel unit (4.5) having the turning axis (k), which can swivel about the turning axis (k) between a position A1 in the region of the workpiece changer (2) and a position A2 in the region of the machining station (5).
15. Device per Claim 14, characterized in that the respective translatory carriage (4.4, 4.4') can move via a circulating ball spindle in the direction of the translatory axis and the circulating ball spindle is driven via a toothed belt, while both translatory carriages (4.4, 4.4') have a common or a separate guide rail.
16. Device according to one of the preceding claims, characterized in that the spindle drive is configured as a continuous direct drive.
17. Device per Claim 14, characterized in that the swivel unit is configured as a swivel plate (4.5) and is driven to turn about the turning axis (k) by a swivel arm with a lift cylinder.
18. Method for operating a machining machine (1) according to one of Claims 2 to 17, characterized in that at least the lifting motion in the direction of the lifting axis (w) and the swivel motion about the turning axis (k) occurs in common for both tool drives (4a, 4b).

19. Method for operating a machining machine (1) according to one of the preceding claims, characterized in that the individual motion sequence of the two swivel axes (b1, b2) and the two displacement axes (x1, x2) is attuned while machining the lenses, so as to avoid a collision of the spindles (4.1, 4.1').
20. Method for operating a machining machine (1) according to one of Claims 8 to 17, characterized in that
  - a) the tool magazine (6.1, 6.1') is detached for removal from the machining machine (1) and kept outside in liquid for wetting;
  - b) the tool magazine (6.1, 6.1') is installed in the machine and fastened with regard to the definite position.